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COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

GROUP OF EXPERTS ON EXPLOSIVES

Eighteenth session
Geneva

REPORT OF THE GROUP OF EXPERTS ON ITS EIGHTEENTH SESSION (7 - 11 August 1978)

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REPORT

1. The Group of Experts on Explosives held its eighteenth session at Geneva from 7 to 11 August 1978. Experts from the following countries participated in its work: Canada; France; Italy; Germany, Federal Republic of; Japan; Union of Soviet Socialist Republics; United Kingdom; United States of America. Pursuant to paragraph 7 of Economic and Social Council resolution No. 2050 (LXII) of 5 May 1977, the expert from Japan in the Committee of Experts had notified the Secretariat of his intention to participate in the work and voting of the Committee's subsidiary bodies. The Inter-Governmental Maritime Consultative Organization (IMCO) and the Central Office for International Railway Transport (OCTI) also took part in the Group's work.

ADOPTION OF THE AGENDA

2. The Group adopted the provisional agenda proposed by the secretariat (ST/SG/AC.10/C.1/R.12).

ELECTION OF CHAIRMAN

3. Mr. E.G. WHITEHEAD (United Kingdom) was re-elected Chairman on the proposal of the expert from the United States of America, supported by the experts from Canada and the Union of Soviet Socialist Republics. The other experts signified their unanimous agreement.

PARTICIPATION OF AN OBSERVER IN THE WORK OF THE GROUP

4. The Group invited experts from the Netherlands to participate in the Group's work at its next session.

ENTRIES IN CLASS 1

General text introducing Chapter 2

5. The Group considered what general text should be included at the head of Chapter 2 in order to meet the point raised by IMCO in paragraph 8 of document ST/SG/AC.10/C.1/R.2. The expert from the United Kingdom proposed that a text included in the 1973 supplement to the Recommendations, which text had not been reproduced in the current Recommendations, should be reinstated. It was agreed that he would submit that text at a later stage, taking into account the revision of Chapter 13 now proceeding, of which the expert from the United States of America had reminded the meeting.

6. The prepared text was unanimously adopted by the Group in the form reproduced in annex 2 hereto. However, the expert from the United States of America pointed out that such reinsertion in Chapter 2 seemed to conflict with paragraphs 13.5 and 13.7 of the Recommendations.

Diazo compounds

7. The Group resumed consideration, begun at the previous session, of the classification of the diazo salts and compounds which might be assigned to Class 1 (ST/SG/AC.10/C.1/1, para. 6). To settle the problem the expert from the United Kingdom proposed adoption of the solution set out in document ST/SG/AC.10/C.1/R.100, likewise submitted to the Group of Rapporteurs. In the end, after a long discussion, the Group agreed that any substance with explosive properties should be inclu in Class 1.

Styphnic acid

8. On the proposal of the expert from the United Kingdom, the discrepancy in the references to trinitroresorcinol (styphnic acid) (0219) respectively contained in chapter 2 of the Recommendations and in the index (ST/SG/AC.10/C.1, para. 9) was eliminated by instructing the secretariat to bring the text of the index (0219) into line with the text in chapter 2 (see annex 2 hereto).

Isosorbide dinitrate and pentaerythrite tetranitrate

9. The expert from the Federal Republic of Germany introduced the proposals contained in document ST/SG/AC.10/C.1/R.19, which replaced those in the document (ST/SG/AC.10/C.1/R.4) submitted at the preceding session. The Group took the view that isosorbide dinitrate containing not less than 60 per cent lactose, mannose, starch or $CaHPO_4$ by weight did not belong to Class 1. It recommended the Group of Rapporteurs to consider the possibility of classifying that substance in Division 4.1. The Group of Experts did not support the expert from the Federal Republic of Germany in his proposal concerning mixtures of pentaerythrite tetranitrate containing not less than 80 per cent lactose, mannose, starch or $CaHPO_4$ by weight. It was equally divided on the question of assigning the "Z" symbol to the substance, a step which might have settled the question.

Dipicryl sulphide

10. The Group considered the outstanding question concerning dipicryl sulphide (0401), a substance added to the list at the previous session. It took the view that since the substance was not toxic the asterisk placed opposite its name in annex 2 to report ST/SG/AC.10/C.1/1 was unnecessary.

Dinitrobenzene and tetrazol-1-acetic acid

11. The Group considered the proposal by the Government of the Federal Republic of Germany in document ST/SG/AC.10/C.1/R.18 concerning dinitrobenzene and tetrazol-1-acetic acid, which substances in that Government's view should be included in Class 1 (1.5 C and 1.4 C respectively). The proposal was adopted (see annexes 2 and 4 hereto).

Boosters (gaines)

12. At its previous session the Group had agreed to review the description of "Boosters (gaines)" at the present session (ST/SG/AC.10/C.1/1, para. 15). The expert from the United States of America, at whose suggestion the decision to review the matter had been taken, said that what he had had in mind was the need to review the packagings, and not (as stated in the report on the previous session) the description. He added that the word "gaines" was outdated, so that its use in the definition should nevertheless be reviewed. Having noted that the problem had already been dealt with in annex 2 to the report on the Group's previous session (ST/SG/AC.10/C.1/1), the Group, confirming its earlier decision, agreed to delete the word "gaines" wherever it occurred in the Recommendations, except in the index and the descriptions, where it will continue to appear (see ST/SG/AC.10/C.1/1, annex 2).

Replies to questions raised by the Group of Rapporteurs at its twentieth session

13. Annex 3 to the report of the Group of Rapporteurs on its twentieth session (ST/SG/AC.10/C.2/1) raised a number of questions to which the Group of Experts gave the following replies.

14. Regarding the three substances listed under (1)(a) in the annex, the Group considered that, in general, a primary explosive should remain in Class 1 whatever the percentage of added water, and that no substance could be placed in Class 4 if the probability of explosion during carriage was greater than that attaching to any substance in Division 1.5, unless quantity limitations were prescribed when the substance was placed in Class 4.

15. With regard to the opinion to be transmitted to the Group of Rapporteurs on the three substances specifically mentioned, the Group of Experts felt that it did not yet possess information sufficiently precise to serve as a basis for a considered opinion on the matter. In its view it would be for the Governments having an interest in the carriage of one or the other of those substances to supply appropriate information on the substance's behaviour.

16. On the questions raised under (1)(b) the Group expressed the following opinions:

In the absence of information on the properties of the articles classified by the Group of Rapporteurs in Division 4.1 (entries 2791 and 2792), the Group of Experts was unable to decide whether those articles did or did not belong to Class 1, and it recommended meanwhile that they should be regarded as potential explosives (see "CARTRIDGES, POWER DEVICE" and "IGNITERS");

There were already seven entries relating to fuzes, and the competent authorities should use those entries for classifying the articles in question;

The same observation applied to power devices, for which there were four entries;

The ammonium perchlorate in question was already included in Class 1 (entry 0402); and

Nitrocthane could in the Group's view not be considered as belonging to Class 1.

Various amendments of detail

17. Turning to annex 4 to report ST/SG/AC.10/C.1/1, the Group agreed that under figure 4.2, paragraph (b) (definition of Compatibility Group F) the word "propulsive" should be replaced in the English text by the word "propelling", in order to bring the text into line with the other provisions including the term.

18. The proposals by the expert from Canada in document ST/SG/AC.10/C.1/R.14 were adopted as set out in annex 2 hereto.

ENTRIES IN DIVISION 1.5 AND APPROPRIATE TEST CRITERIA

19. The expert from Canada outlined the report (ST/SG/AC.10/C.1/R.15) on the informal meeting which the experts had held at Ottawa from 8 to 12 May 1978, at the invitation of the expert from Canada, in order more particularly to consider the matters referred to in paragraph 51 of the Group's report on its previous session (ST/SG/AC.10/C.1/1).

20. The Group applied itself first to revising the definition of Division 1.5, and it adopted the revised definition proposed in document ST/SG/AC.10/C.1/R.15, paragraph 8, as amended by the expert from the United States of America (see annex 1 hereto). It also decided to request IMCO to show Division 1.5 separately from the other Classes and Divisions in the same way as for Division 1.1, Compatibility Group D.

21. The definition of type B blasting explosives reproduced in paragraph 9 of the report on the Ottawa meeting was approved (see annex 3 hereto).

22. The Group then considered the flow-chart reproduced in document ST/SG/AC.10/C.1/R.15, annex 2, amendments to which were proposed from the floor by the expert from the United States of America with the aim of broadening its scope. The proposed amendments prompted a number of comments by the expert from the Federal Republic of Germany.

23. Faced with the choice between considering first the controversial points emphasized by the expert from the Federal Republic of Germany, or considering concurrently the provisions on tests and the two flow charts under discussion (that in document ST/SG/AC.10/C.1/R.15, annex 2, and that proposed by the expert from the United States of America), the Group opted for the second alternative.

24. The discussion enabled the difficulties to be solved and the two flow charts submitted to be reconciled. In the end the Group adopted the flow chart and provisions set out in annex 5 hereto.

25. The Group agreed moreover that the provisions adopted at the current session and annexed to the sessional report (annex 5) should first be commented on by the experts and organizations concerned. The Group would then submit proposed recommendations to the Committee in the light of the comments thus received.

26. The Group approved as a whole the report of the experts who had met at Ottawa from 8 to 12 May 1975 and expressed its thanks to the Canadian expert for his invitation.

27. The Group considered the proposal by the Government of the Federal Republic of Germany concerning the Koenen test (ST/SG/AC.10/C.1/R.17); the proposal was adopted. The expert from the United States of America entered a reservation on the decision taken.

28. On the proposal of the United Kingdom expert, the Group endeavoured to determine what scale should be adopted for the "external-fire test" or "bonfire test" 3 (c). The Group failed to agree on the scale of the test and the question was left pending.

29. The note "N.B. Most important" in paragraph 12.1 ("Test Series 1") of document ST/SG/AC.10/C.1/R.15 prompted a long discussion in the course of which the expert from the Federal Republic of Germany expressed the view that it would lead to classification difficulties. A more flexible version of the text was adopted (see annex 5 hereto).

30. The expert from the United States of America proposed amendments to document ST/SG/AC.10/C.1/R.15, paragraph 11. The Group decided that the content of that paragraph would not be included in annex 5 hereto, as the question would have to be left open.

31. The United Kingdom expert explained the items not yet considered in document ST/SG/AC.10/C.1/R.24. Those items prompted a highly technical exchange of views between the author of the document and the experts from the United States of America and the Federal Republic of Germany.

32. The United Kingdom expert outlined document ST/SG/AC.10/C.1/R.21, in which his Government proposed test procedures for explosive substances after they had been filled into articles or packed for conveyance. In his opinion it would be sufficient to include in the Recommendations a provision similar to the one included in RID.

33. The expert from the United States of America said that he agreed with the United Kingdom expert with regard to the aim sought, and that it was with that aim in mind that he had submitted proposals for a mechanical-safety test. The United Kingdom expert said that he would continue to study the matter.

34. The representative of IMCO, reverting to document ST/SG/AC.10/C.1/R.15, paragraph 10, and to the note concerning the definition of Division 1.5, asked what should be done with small quantities of substances of Division 1.5 as regards "segregation". He was told in reply that any cargo for carriage by sea should be treated as belonging to Division 1.1.

PACKING

Stacking test

35. The Group examined the proposal submitted to the Group of Rapporteurs by the Rapporteur from Italy (ST/SG/AC.10/C.2/125), which largely related to the carriage of explosives. The Group considered that the best solution would be to delete the sentence "However, for sea transport ... is 8 m." from paragraph 9.101 (Stacking test).

Packing methods

36. Annex 3 to the Group's report on its previous session prompted comments, more particularly by the representative of IMCO, concerning packing method E 107. In the end the Group confirmed its previous position and requested the secretariat to take note of two minor corrections, i.e. the replacement of "(page 207)" by "(page 229)" in the second line of the English text of annex 3 and the deletion of "E 136" from the list of packing methods given further down on the same page. It was also agreed that packing method E 115 should be amended as shown in annex 4 hereto.

37. Packing method E 25 for the substances referred to in paragraph 11 hereof is also referred to in that annex.

38. The Group considered two proposals by the expert from the United Kingdom aimed at amending packing methods E 112 and E 6, i.e. to add "Plywood (4D1)" to the list of outer packagings for method E 112 and to add "Drums, fibreboard (1G1, 1G2 and 1G3)" under method E 6.

39. It was pointed out that the first of those proposals had been met by the decision taken at the previous session to cover such cases by the general provision 10.2. The second proposal was adopted, a reservation being entered by the expert from Canada (see annex 4).

TECHNICAL AND EDITORIAL REVISION OF CHAPTERS 4 AND 10 OF THE RECOMMENDATIONS

Definition of the terms "mass explosion" and "entire load"

40. In document ST/SG/AC.10/C.1/R.22 the Government of the United Kingdom had brought up the question of the interpretation to be placed on the terms "mass explosion" and "entire load" as used in paragraph 4.65 of the Recommendations.

41. The expert from the United States of America described the practice followed in his country and stated that the figure of 90 per cent cited in paragraph 3 of the document was applied in a particular case only.

42. Referring to paragraph 5, the French expert said that the case in question concerned packages of small quantities carried on road vehicles, whereas the United Kingdom interpretation related to large loads carried in confined spaces.

43. The United Kingdom expert thanked the previous speakers for their explanations and said that he would revert to the matter at a later stage.

Recasting of Chapter 4 of the Recommendations ("Special recommendations relating to Class 1")

44. The Group first considered document ST/SG/AC.10/C.1/R.23, which was introduced by the expert from the United Kingdom and sought to recast Chapter 4 of the Recommendations (the aforesaid document amplified the text of document ST/SG/AC.10/C.1/R.8, drafted by a small group during the previous session). The document was adopted in principle and a small group was set up to revise it, as to form only, during the present session.

45. The expert from the United Kingdom undertook to prepare for the next session a new version of document ST/SG/AC.10/C.1/R.23 which would be based on the text of document ST/SG/AC.10/C.1/R.8/Rev.1 (to be prepared by the secretariat), which would reproduce the results of the small group's work and would take into account such decisions adopted at the present session as affected the provisions of document ST/SG/AC.10/C.1/R.23.

Recasting of Chapter 10 of the Recommendations

46. The expert from the Union of Soviet Socialist Republics stated his views on a new edition of the Recommendations, which should achieve simplification, and he introduced the proposals contained in annex 4 to document E/CN.2/CONF.5/R.611, which related particularly to chapter 10.

47. Those proposals were approved by the Group and will be required to be taken into consideration in any new edition of the Recommendations.

48. The expert from the Union of Soviet Socialist Republics agreed to prepare a draft on those lines for chapter 10 and transmit it to the secretariat in the near future.

STRUCTURE OF THE RECOMMENDATIONS

Content of the list

49. The expert from the United Kingdom outlined document ST/SG/AC.10/C.2/R.95, submitted to the Group of Rapporteurs by the Rapporteur from the United Kingdom. He pointed out that the guidelines indicated in the document were those already followed by the Group of Experts.

Chapter 9 of the Recommendations ("General recommendations on packing")

50. The Group of Experts endorsed the proposals put forward by the Rapporteur from the Union of Soviet Socialist Republics in document E/CN.2/CONF.5/R.611, annex 3, and recommended the Group of Rapporteurs to note that position.

Chapter 13 of the Recommendations ("Recommendations on consignment procedures")

51. The expert from the United States of America proposed that the Group of Experts should at the current session express an opinion on the work done by the Group of Rapporteurs on recasting chapter 13 of the Recommendations, in so far as that work related to Class 1. The Group approved that proposal.

52. As it was not found possible to make the most recent version of the proposals relating to Chapter 13 available at the time of the discussion, the Group of Experts asked the Committee of Experts to refer to the Group, for its opinion, the parts of Chapter 13 which affected Class 1.

OTHER MATTERS

Title of Division 1.2

53. The expert from the United States of America proposed that in paragraph 1.12 of the Recommendations the title following "Division 1.2" should be amended to read: "Articles which have a projection hazard but not a mass explosion hazard". A decision was deferred until the next session.

Special recommendations relating to Class 1 (paragraph 4.1)

54. The Group adopted a suggestion by the representative of IMCO aimed at improving the amendment made at the previous session to paragraph 4.1 (b) (ST/SG/AC.10/C.1/1, annex 4) (see annex 3 hereto).

New entries for "Fuzes, detonating, with protective features"

55. The expert from the United Kingdom proposed the insertion of three new entries for "Fuzes, detonating, with protective features". The proposal was adopted (see annex 2 hereto).

Hazards related to chemical compatibility

56. By document ST/SG/AC.10/C.1/R.20 the Group had been made aware of a problem with which the Australian and New Zealand authorities had to contend - the hazards that chemical incompatibility could create when type C blasting explosives containing a chlorate were carried together with blasting explosives of type A, B or D containing ammonium salts.

57. The Group confirmed its earlier position as set forth in paragraph 3 of the document, and the expert from the United Kingdom undertook to bring that position to the attention of the authorities which had raised the problem with the Group.

Multiple labelling

58. The Group considered the proposals put forward by the expert from the United States of America in document ST/SG/AC.10/C.1/R.16 concerning the multiple labelling of explosives. The Group endorsed the document's conclusions and transmitted them to the Group of Rapporteurs.

FILM SHOWING

59. A film was shown by the United Kingdom expert on trials carried out in his country in March and April 1978 for the purpose of demonstrating the effects of fire on articles of Divisions 1.2, 1.4 and 1.4 S and confirming their respective classifications. The film showed the results of six external-fire tests on six different articles of Class 1, one external-fire test on household articles (e.g. camping-gas aerosol canisters) and one test on articles containing packaged detonating explosives of which one had exploded. The Group thanked the United Kingdom expert for showing the film, which had gripped the audience's attention throughout.

FUTURE WORK

60. The Group considered that its programme of work for 1979 and 1980 should be as follows:

1. Revision of Chapter 13 with reference to Class 1.

2. Completion of system of test procedures for determining the assignment of substances and articles to Class 1.

3. Confirmation of the validity of the system of test procedures by exchanging results of tests performed on the basis of the reference standards.

4. Incorporation of the systems of test procedures in the revised Chapter 4 of the Recommendations.

5. Revision of Chapter 10 (packing methods).

6. Formulation of provisions for the loading of intermodal containers with substances and articles of Class 1, and of provisions governing the carriage of such containers.

7. Additions to the entries and packing sheets for Class 1.

CALENDAR OF WORK

61. The Group took the view that it must be able to hold at least one session a year in order to carry out its work. That session should be associated with a session of the Group of Rapporteurs.

APPROVAL BY THE COMMITTEE OF THE GROUP'S REPORTS ON ITS SEVENTEENTH AND EIGHTEENTH SESSIONS

62. The Group submits to the Committee of Experts, for approval, the reports on its seventeenth and eighteenth sessions (ST/SG/AC.10/C.1/1 and ST/SG/AC.10/C.1/2).

Annex 1

SCOPE OF THE RECOMMENDATIONS
(ST/SG/AC.10/1/Rev.1, Chapter 1)

Amendments adopted by the Group

Paragraph 1.12

Read the definition of Division 1.5 as follows:

"Division 1.5. Very insensitive substances which have a mass explosion hazard.

This Division comprises explosive substances which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport. As a minimum requirement they must not explode in the external fire test (see 4.63).

Note. The probability of transition from burning to detonation is greater when large quantities are carried in a ship.".

Annex 2

LISTING AND CLASSIFICATION

LIST OF DANGEROUS GOODS MOST COMMONLY CARRIED
(ST/SG/AC.10/1/Rev.1, Chapter 2)

Amendments adopted by the Group

(1) Chapter heading

Insert after the heading of the Chapter:

"(For Class 1, the authorized short name is indicated in the list by capital letters. Capital letters in parentheses indicate an authorized alternative short name).". 1/

1/ Insert the same text at the end of paragraph 13.5.

(2) Additions to the list

Serial Number	Designation	Class, Division	Subsidiary Risks	Special Provisions	Packing Method
0406	DINITROBENZENE	1.3 C	+		E 25
0407	TETRAZOL-1-ACETIC ACID	1.4 C	+		E 25
0408	FUZES, DETONATING* with protective features	1.1 D	+	119	E 137
0409	FUZES, DETONATING* with protective features	1.2 D	+	119	E 137
0410	FUZES, DETONATING* with protective features	1.4 D	+	119	E 137

(3) Amendments to existing entries

0110 Read:

English	French
"GRENADES, PRACTICE, hand or rifle"	"GRENADES D'EXERCICE à main ou à fusil".

0214 Replace "35 per cent" by "30 per cent".

0219 "TRINITRORESORCINOL (STYPHNIC ACID), dry or containing, by weight, less than 20 per cent water (or mixture of alcohol and water) 1.1 D + E 2"

0318)
0372) Same amendment as to 0110.

(4) Deletion

0088 Delete the entry.

SPECIAL PROVISIONS RELATING TO INDIVIDUAL SUBSTANCES AND ARTICLES
(ST/SG/AC.10/1/Rev.1, Chapter 3)

Amendments adopted by the Group

"Special recommendation

110. The detonating fuze must incorporate protective features such that it is very unlikely to cause detonation of a contrivance in the conditions encountered in transport (paragraph 4.60 "Initiation, means of ..." (2)).".

INDEX

Page 341, insert:

"DINITROSOBENZENE	1.3 C	0406".

Page 346, insert:

"FUZES, DETONATING* with protective features	1.1 D	0408
	1.2 D	0409
	1.4 D	0410".

Insert in the French index only (page 368): [Does not affect the English text].

Page 372, insert:

"TETRAZOL-1-ACETIC ACID	1.4 C	0407".

Page 344, delete:

"EXPLOSIVES, seismic*	0088".

Page 347, column 1, second entry, amend to read:

"GRENADES, PRACTICE, hand or rifle".

Page 374, column 1, last entry (0214):

Replace "35 per cent" by "30 per cent".

Page 57, (column 2, thirteenth entry), read:

"TRINITRORESORCINOL (STYPHNIC ACID), dry or containing, by weight, less than 20 per cent water (or mixture of alcohol and water)	1.1 D	0219".

ANNEX 3

SPECIAL RECOMMENDATIONS RELATING
TO CLASS 1
(ST/SG/AC.10/1/Rev.1, Chapter 1)

Amendments adopted by the Group

Paragraph 4.1 (b)

Replace the last sentence by:

"The transport of an explosive substance whose sensitivity to friction and impact is equal to or greater than that of dry pentaerythrite tetranitrate (PETN) should be prohibited except with the special authorization of the competent national authority."

Paragraph 4.63

Under "Explosives, blasting, type B", read:

"Blasting explosives which are mixtures of ammonium nitrate or other inorganic nitrates with explosives such as trinitrotoluene, with or without other substances such as wood-meal and aluminium powder, or mixtures of ammonium nitrate or other inorganic nitrates with other combustible substances which contain no explosive ingredients. */ These explosives shall not contain nitroglycerin, similar liquid organic nitrates, or chlorates.

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*/ The 'explosive ingredients' are 'explosive substances' as defined in paragraph 1.11.".

Annex 4

SPECIAL RECOMMENDATIONS ON PACKING FOR CLASS 1
(ST/SG/AC.10/1/Rev.1, Chapter 10)

Amendments adopted by the Group

Method P 6

Under "(a)", "(i)", "Outer:" and "(a)", "(ii)", "Outer:", add under "Drums":

"Fibreboard, convolutely wound plies (1G1)
fibreboard, spirally wound plies (1G2)
fibreboard, solid (1G3)".

Add:

"Method P 25

Packagings

Inner: Bags
plastics

Outer: Drums
fibreboard, convolutely wound plies (1G1)
fibreboard, spirally wound plies (1G2)".

Method P 115

Under "Outer", read at the end:

"steel (1A1)".

Delete the heading "Particular packing requirements" and the sentence following it.

Annex 5

PROCEDURES FOR DETERMINING THE ASSIGNMENT OF SUBSTANCES AND ARTICLES TO CLASS 1 AND AMONG THE DIVISIONS OF THAT CLASS, WITH PARTICULAR REFERENCE TO DIVISION 1.5

Adopted by the Group

(For action to be taken, see para. 25 of the report)

The following series of tests were adopted for inclusion in document ST/SG/AC.10/C.1/R.8/Rev.1:

"The inclusion of a substance or article in Class 1 requires both an assessment of its physical and chemical stability and a determination of the potential for explosion and deflagration. The data yielded by tests should by analysed systematically as indicated in the flow chart reproduced in appendix 1.

1. Test series 1

These tests will include:

(a) Small-scale preliminary tests;

(b) A shock test with a defined booster and confinement (e.g. a ballistic mortar or a Trauzl test);

(c) A combustion test or a thermal test (e.g. a Koenen test). If with an orifice of 2.0 mm or more an explosion is produced, the substance tested shall be assigned to Class 1 unless it is too dangerous for transport;

(d) An impact test;

(e) Such other, additional tests as may be required by the competent authorities.

2. Test series 2

These tests will include:

(a) An impact test. This test will have been performed as part of series 1. Because of the large number of procedures, the result will be related to a reference substance;

(b) A friction test. The comments made concerning the impact test apply to this test also;

(c) A stability test. [There was no support for a proposal that the test should demonstrate six months' stability at 55° C. The Government of the United States of America proposed that the present requirement of 48 hours at 75° C should remain.];

(d) A small-scale fire test. Examples referred to were the BAM gaslighter test and the United Kingdom Bickford fuse test. The test should determine the ease of ignition and the tendency to burn to detonation.

3. Test series 3

These tests will include:

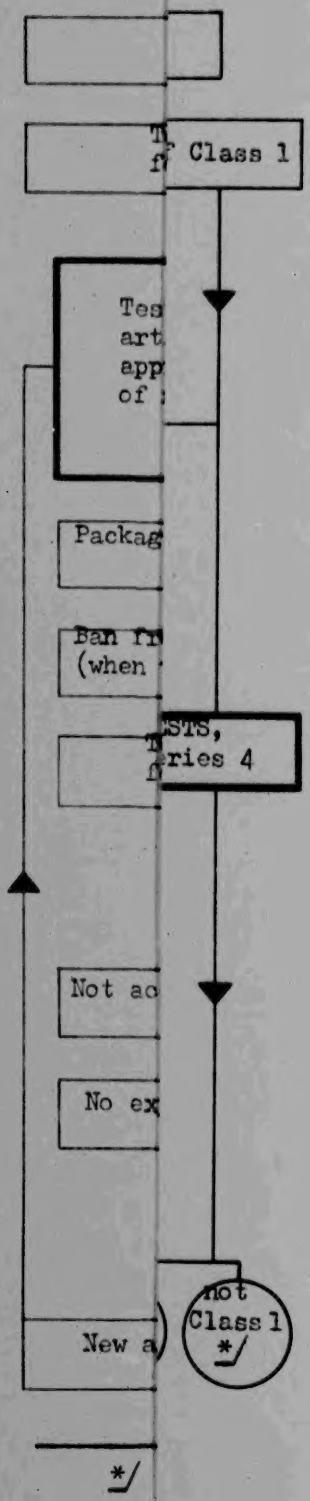
(a) A shock test, which may be a cap test or an equivalent test and shall be conducted at 25° C;

(b) A test of transition from deflagration to detonation (DDT);

(c) An external-fire test, or a test on a scale to be determined.

4. Test series 4

These tests are described in appendix 2.".


Class 1
Not
Class 1
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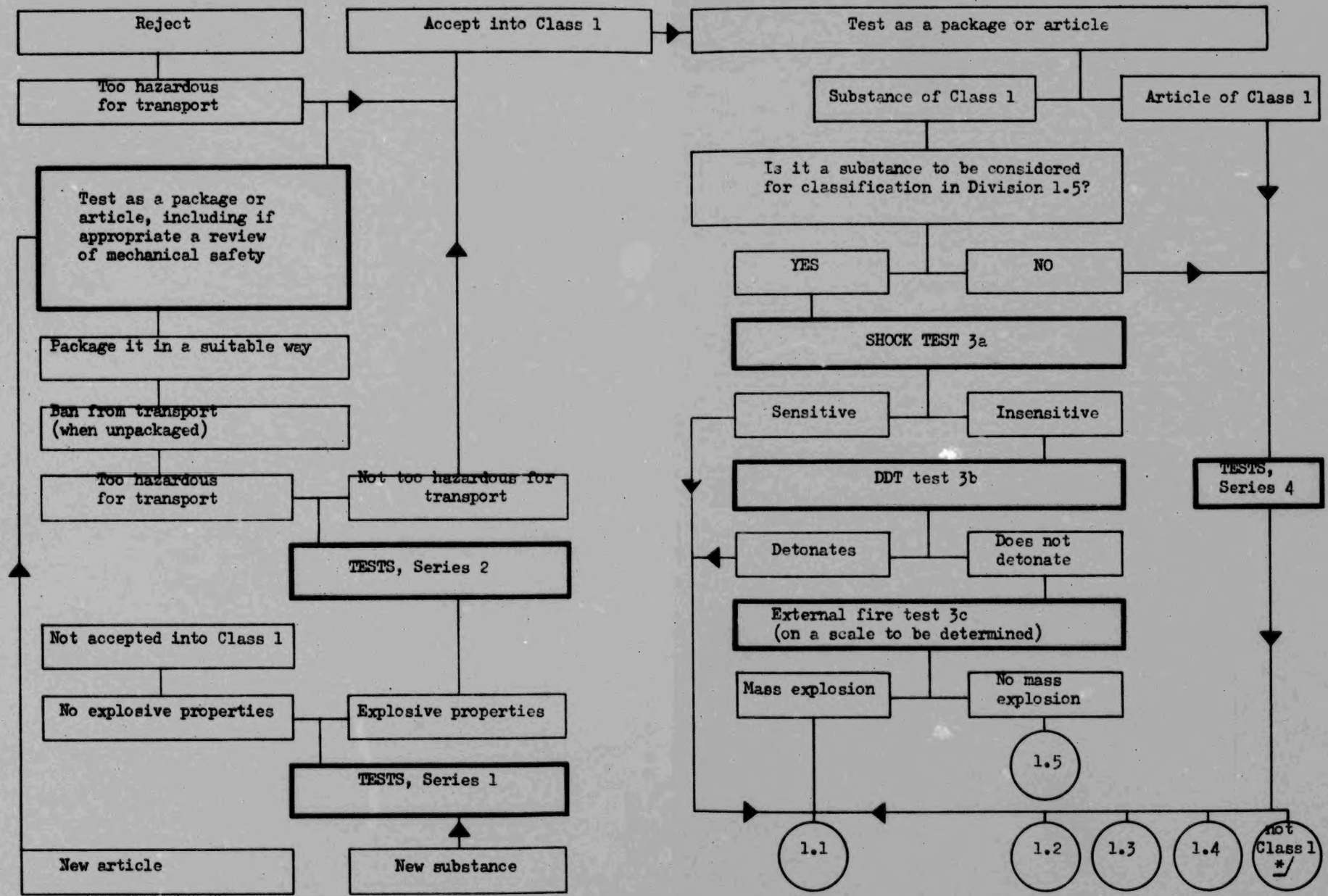
Appendix 1



*/ See paragraph 1.11(b) and (c).

Appendix 2

Description of series-4 tests

1. General

1.1. These instructions govern the hazard-division assignment and compatibility-group assignment of substances or articles of Class 1.

2. Hazard-division assignment

2.1. General observations

2.1.1. Assignment to a hazard division shall be performed on the basis of test results. The tests shall be applied to packages of explosive substances and articles in the condition and form in which they are tendered for carriage. Except as provided in paragraph 2.1.2., all types of packaging containing substances or articles of Divisions 1.2, 1.3 and 1.4 shall be subjected to the tests. Where explosive articles are to be carried without packaging, the tests shall be applied to the non-packaged articles.

2.1.2. Verification of the classification shall be undertaken if the substance or article or its packaging is degraded and the degradation might affect the behaviour of the item in the tests.

2.1.3. The tests shall not be required if:

The article, the explosive and the packaging */ can be unambiguously assigned to a hazard division by a qualified explosives expert on the basis of results from other tests or of available information **/, or

The packaged explosives are assigned to hazard division 1.1.

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*/ Note by the reviser: It would seem more logical to keep to the usual terms, i.e. "The explosive substance or article and the packaging" (in French = "- si la matière ou objet explosible et l'emballage").

**/ Note by the reviser: This English version is based on the present reviser's understanding of the original English text in document ST/SG/AC.10/C.1/R.15, the French version has (in French) "... or of information furnished by a qualified explosives expert".

2.2. Tests for hazard-division assignment

2.2.1. Types of tests

There are three types of tests;

Test A (single-package test)

A test on a single package for the purpose of determining:

Whether initiation or ignition in the package causes burning or explosion and whether burning or explosion is propagated in the package, and

In what way the surroundings are endangered by these effects.

Test B (stack test)

Test on a stack of packages for the purpose of determining:

Whether and in what way burning or explosion in the stack is propagated from one package to another and

In what way the surroundings are endangered in this event.

Test C (external-fire test)

Test on a stack of packages for the purpose of determining:

How the packages in the stack behave when involved in an external fire; and

Whether and in what way the surroundings are endangered by blast waves, heat radiation and/or fragment projection.

2.2.2. Sequential order of tests

The geometrical arrangement and the means of initiation shall be such as to produce the most disadvantageous test results.

2.2.2.1. Tests A, B and C shall be performed in alphabetical order.

(a) If explosive articles are carried without packaging, test A may be waived.

(b) If the content of the package in test A explodes so feebly as to exclude propagation of the explosive effect from one package to another, test B may be waived.

(c) If in test B virtually all the packages in the stack explode practically instantaneously, and the explosive substance or article is therefore to be assigned to hazard division 1.1., test C may be waived.

2.2.3. Repetition of tests

2.2.3.1. Tests A and B shall be carried out at least three times unless explosion of the entire contents occurs earlier; test C is normally performed once only.

2.2.3.2. If the results of the recommended number of tests do not enable the hazard division to be determined, the number of tests shall be increased.

2.2.4. Description of tests

2.2.4.1. Test A

2.2.4.1.1. The package shall be placed on the ground. For confinement, boxes or bags filled with earth or sand shall be placed around and on top of the package. The thickness of the confinement shall be not less than 0.5 m in every direction. If a dimension of the package exceeds 1 m, the thickness of the confinement shall be not less than 1 m in every direction.

2.2.4.1.2. The package may also be placed in a pit of sufficient depth. It shall be covered with boxes or bags filled with earth or sand so as to ensure adequate confinement for the top of the package also.

2.2.4.1.3. The point of initiation or ignition shall be situated at the centre of the package.

2.2.4.1.3.1. Packages containing explosive substances:

The means of initiation used shall be the standard electric blasting cap containing 0.6 g PETN (see Explosivstoff 21 (1973) No. 5, pp. 66 and 67) or some other electric detonator having the same effect.

The means of ignition shall be an electric igniter with a minimum ignition load or a thermal igniter capable of igniting the substance without difficulty.

2.2.4.1.3.2. Packages containing articles

Articles provided with their own means of initiation or ignition:

The functioning of an article near the centre of the package shall be stimulated by the article's own means of initiation or ignition. Other means of initiation or ignition may be used if under the original conditions it is impossible to stimulate functioning of the article. The article's own means of initiation or ignition may be replaced by another form of stimulus having the same effect.

Articles not provided with their own means of initiation or ignition:

An article near the centre of the package shall be replaced by another article whose functioning can be stimulated. In the same manner as the functioning of the article it replaces. If this [illegible] is likewise impossible in a particular case, the

2.2.4.2. Test B

2.2.4.2.1. At least five packages shall be stacked on the ground.

2.2.4.2.2. To ensure the necessary confinement, boxes or bags filled with earth or sand shall be placed around and on top of the stack of packages. The thickness of the confinement shall be not less than 1 m.

2.2.4.2.3. The point of initiation or ignition shall be situated in a package near the centre of the stack. The procedures defined in paragraphs 2.2.4.1.3.1. and 2.2.4.1.3.2. shall be followed.

2.2.4.2.4. Articles carried without packaging shall be tested in the same manner as packed articles having their own means of initiation or ignition.

2.2.4.3. Test C

2.2.4.3.1. Stack not less than five packages on a metal grid about 1 m above the ground. If necessary, encircle the stack with a steel strip to support it during the test.

2.2.4.3.2. Pile air-dried pieces of wood (not more than 30-50 mm thick) to form a lattice beneath the grid and round the stack of packages over a width of at least 50 cm in every direction. The lateral distance between the laths should be about 10 cm. Drench the whole with about 20 litres of fuel oil mixed with 10 per cent petrol and ignite the pile on two sides simultaneously. It is recommended that enough fuel should be used to keep the fire burning for at least 30 minutes or for the time considered necessary.

2.2.4.3.3. The stack of wood beneath the grid may be replaced by a receptacle filled with fuel oil with a 10-per-cent admixture of petrol. The surface area of the receptacle shall be greater than that of the stack of wood on the grid. The distance between the grid platform and the receptacle shall be 0.5 m.

2.2.4.3.4. Such data shall be assembled so as to enable the number of projections of appreciable size or range to be assessed.

2.2.5. Test report

2.2.5.1. A report on the series of tests shall be drawn up in accordance with the requirements of the competent authority. It shall in particular contain information on:

The composition of the substance or the structure of the article;

The quantity of substance or number of articles per test;

The type and construction */ of the packaging,

The test assembly, including in particular the nature, quantity and arrangement of the means of initiation or ignition used,

The course of the test, including in particular the time elapsing until the occurrence of the first noticeable **/ reaction of the substance or articles, the duration and characteristics of the reaction, and an estimate of the latter's completeness,

The effect of the reaction on the immediate surroundings (up to 25 m from the site of the test),

The effect of the reaction on the more remote surroundings (more than 25 m from the site of the test), and

The atmospheric conditions during the test.

2.2.6. Assignment to hazard divisions

2.2.6.1. A substance or article shall be assigned to the hazard division which corresponds to the results of the tests to which the substance or article, as packed for carriage, has been subjected. Other test results, and data assembled from accidents which have occurred, may also be taken into account. Definitions of the hazard divisions are given in Chapter 1.

2.2.6.2. If in test B or test C explosion of virtually the entire contents occurs almost instantaneously, the substance or article ***/ as packed for carriage shall be assigned to Division 1.1.

2.2.6.3. If in test B or test C only a few items explode at one time ****/ and the major hazard presented is that from dangerous projections, the substance or article shall be assigned to Division 1.2.

2.2.6.4. If in test A, B or C violent combustion occurs with no dangerous blast or projections, and radiant heat constitutes the major hazard, the substance or article shall be assigned to Division 1.3.

2.2.6.5. If during test B or test C combustion of low violence accompanied by moderate radiation of heat occurs, with no dangerous blast or projections, the substance or article shall be assigned to Division 1.4.

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*/ Note by the reviser: The French text has "matière" (= material).

**/ Note by the reviser: The French text has "notable" (= notable, noteworthy, substantial).

***/ Note by the reviser: The French text has "article" instead of the usual "objet".

****/ Note by the reviser: The French text omits "at one time".

2.2.6.6. Substances and articles in this division so packaged or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder fire-fighting or other emergency response efforts, in the immediate vicinity of the package, are in Compatibility Group S.

3. Determination of compatibility group

The compatibility group of the substance or article shall be determined on the basis of the description of compatibility groups given in fig. 4.2.